

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner
 US Department of Commerce
 United States Patent and Trademark
 Office, PCT
 2011 South Clark Place Room
 CP2/5C24
 Arlington, VA 22202
 ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 23 May 2001 (23.05.01)	
International application No. PCT/EP00/08441	Applicant's or agent's file reference TS 0793 PCT
International filing date (day/month/year) 29 August 2000 (29.08.00)	Priority date (day/month/year) 31 August 1999 (31.08.99)
Applicant KUIPERS, Herman, Pieter, Charles, Eduard et al	

1. The designated Office is hereby notified of its election made:



in the demand filed with the International Preliminary Examining Authority on:

21 March 2001 (21.03.01)



in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was

was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Charlotte ENGER Telephone No.: (41-22) 338.83.38
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**fax**

Shell Oil Company

TO S. AHMED – U.S. PATENT AND
TRADEMARK OFFICE (703) 305-3230

FROM JENNIFER ADAMSON – SHELL OIL CO.

DATE JUNE 3, 2002

PAGE 10 + COVER PAGE

SUBJECT SERIAL NO. 10/070213 (TS-0793)

COMMENTS: Please see the attached.

Kind regards
Shell Oil Company

Jennifer Adamson
(713) 241-3901

*** RX REPORT ***

RECEPTION OK

TX/RX NO	8476
CONNECTION TEL	
SUBADDRESS	
CONNECTION ID	
ST. TIME	06/03 14:19
USAGE T	01'52
PGS.	11
RESULT	OK

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

SHELL INTERNATIONALE RESEARCH
MAATSCHAPPIJ B.V.
P.O. Box 302
NL-2501 CH The Hague
PAYS-BAS

PCT

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL PRELIMINARY
EXAMINATION REPORT

(PCT Rule 71.7)

Date of mailing
(day/month/year) 11.12.2001

IMPORTANT NOTIFICATION

Applicant's or agent's file reference
TS 0793 PCTInternational application No.
PCT/EP00/08441International filing date (day/month/year)
29/08/2000Priority date (day/month/year)
31/08/1999

Applicant

SHELL INTERNATIONALE RESEARCH MAATSCHAPPIJ B.V.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.
4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/

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Tel. +31 70 340 - 2040 Tx: 31 651 epo nl
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Authorized officer

Dekker, M

Tel. +31 70 340-4046



PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference TS 0793 PCT	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/EP00/08441	International filing date (day/month/year) 29/08/2000	Priority date (day/month/year) 31/08/1999
International Patent Classification (IPC) or national classification and IPC C01B3/38		
Applicant SHELL INTERNATIONALE RESEARCH MAATSCHAPPIJ B.V.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.


2. This REPORT consists of a total of 7 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 2 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 21/03/2001	Date of completion of this report 11.12.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tlx 31 651 epo nl Fax +31 70 340 - 3016	Authorized officer Van der Poel, W Telephone No. +31 70 340 3760

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP00/08441

1. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17):*)

Description, pages:

1-14 as originally filed

Claims, No.:

1-11 as received on

12/10/2001 with letter of

11/10/2001

Drawings, sheets:

1/2,2/2 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure of the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

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INTERNATIONAL PRELIMINARY
EXAMINATION REPORT

International application No. PCT/EP00/08441

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):
(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-11
	No:	Claims	
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-11
Industrial applicability (IA)	Yes:	Claims	1-11
	No:	Claims	

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
 see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
 see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP00/08441

BEST AVAILABLE COPY**Re Item V**

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

D1: EP-A-629578 (Shell)

D2: US-A-4789540 (Johnson Matthey)

D3: US-A-5939025 (University of Chicago)

1. The subject-matter of claim 1 does not involve an inventive step (Article 33(3) PCT).

- 1.1. In his reply to the Written Opinion the applicant has argued that document D1 cannot be considered to be the closest prior art, because this document concerns a large scale steady state catalytic partial oxidation. However, present claim 1 is not limited to non steady state conditions and/or to small scale catalytic partial oxidation. There is, therefore, no reason not to choose document D1 as closest prior art.

- 1.2. **Starting from Document D1.**

Document D1, which is considered to be the closest prior art, discloses a process for the catalytic partial oxidation of hydrocarbon at elevated pressure and at temperatures of at least 950°C. Space velocities of 500,000 to 10,000,000 Nl/l/hr are used. As catalyst rhodium, iridium or ruthenium is used, for example supported on a honeycomb monolith or a gauze. In example 1 the oxygen-to-carbon ratio is 0.52 and the operating temperature of the catalyst bed is measured by optical pyrometry (see page 4, lines 14-29; example 1).

The difference between claim 1 and document D1 lies in the fact that in the present claim 1 the oxygen-to-carbon ratio is regulated by adjustment of the amount of fuel and/or oxygen on measurement of the temperature of the top of the catalyst bed, whereas in document D1 it is not mentioned how the oxygen-to-carbon ratio is regulated.

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INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET

International application No. PCT/EP00/08441

It is, however, mentioned in document D1 that one measures the temperature of the catalyst bed by optical pyrometry. It would seem to be clear for the person skilled in the art, that for such an exothermic reaction the temperature of the catalyst bed is a very good indication of the progress of the reaction. To adjust the temperature, the skilled person can either change the amount of oxygen or the amount of fuel. Document D2 gives an example of a document in which the flow of oxygen is adjusted on measuring the temperature (see column 3, line 57 - column 4, line 12).

It would, therefore, appear that the person skilled in the art will arrive at the subject-matter of claim 1, starting from document D1.

The subject-matter of claim 1 does not involve an inventive step.

1.3. Starting from Document D3.

Document D3 discloses a partial oxidation reformer. Methanol is fed to the reactor via an ultrasonic nozzle. Air is also fed. The reactor further contains an ignited (possibly containing a palladium catalyst) and a ceramic honeycomb coated with copper zinc oxide catalyst. The reaction temperature is controlled by varying the air feed rate. The reaction temperature is measured all along the length of the reactor using thermocouples. One of the thermocouples measures the temperature just above the catalyst bed (see figure 1; column 3, line 44 - column 4, line 49; column 5, lines 31-34).

The difference between claim 1 and document D3 lies in the fact that in claim 1 the temperature upstream of the catalyst bed is measured by a quick response device, whereas in document D3 the temperature is measured by thermocouple.

In his reply to the Written Opinion the applicant has argued that the person skilled in the art has two choices to make. The first choice is which parameter he has to choose. If he then chooses the temperature of the catalyst bed, he will still have to choose the quick response device to measure the temperature.

The examiner cannot completely agree with the applicant on this point, because D3 already discloses that the temperature is measured.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP00/08441

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Although steps (b) and (c) are not explicitly mentioned in document D3, they are nevertheless inherent from the fact that the air feed is used to control the reactor temperatures. This implies that there is a comparison between temperatures, from which the adjustment of the flow of air is determined. The only difference would, therefore, appear to be the difference identified above, ie in claim 1 a quick response device is used to measure the temperature, whereas in document D3 thermocouples are used.

Quick response devices are known to measure the temperature in a catalytic partial oxidation of hydrocarbons (see document D1). In fact, these devices are generally well-known to measure high temperatures.

The choice of such a quick-response device therefore appears to be an obvious alternative for the thermocouple of D3, especially for the catalytic partial oxidation of hydrocarbons (instead of methanol as used in D3), because the catalytic partial oxidation of hydrocarbons takes place under more exothermic conditions.

The subject-matter of claim 1 would appear not to involve an inventive step.

2. It is not apparent how claims 2-11 could form the basis for a main claim which is novel and involves an inventive step.

Re Item VII**Certain defects in the international application**

1. Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the document D2 is not mentioned in the description, nor is this document identified therein.

Furthermore, the description of document D1 is not complete. It should be made clear that document D1 discloses the measurement of the catalyst temperature using optical pyrometry.

Re Item VIII**Certain observations on the international application**

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP00/08441

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1. Claim 1 does not fulfil the requirements of Article 6 PCT, because claim 1 is not supported by the description.

Claim 1 defines in step (b) that the temperature is measured "by means of a quick-response device within a time frame of 1 to 100 milliseconds". Only one type of such means for measurement of temperature has been disclosed, namely a photodetector device, such as an optical pyrometer. There is no support in the application as filed for extension to all quick response devices working within a time frame of 1 to 100 milliseconds.

It would appear that only support is given for photodetector devices.

A further problem with this formulation is that it merely defines a *desideratum*, namely the desire to measure the temperature within 1 to 100 milliseconds. Claim 1 does not define how the temperature is measured in such a short interval of time.

2. Claim 11 also does not fulfil the requirements of Article 6 PCT.

Claim 11 is directed to transport means defined by process features. Such a definition lacks clarity, as explained in PCT Guidelines III, 4.8a.

12-10-2001

EPO-DG 1

12. 10. 2001

TS 0793 PCT

(52)

AMENDED CLAIMS

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1. A process for the catalytic oxidation of a hydro-carbonaceous fuel into a conversion product, wherein a feed mixture comprising the fuel and an oxygen-containing gas is contacted with a catalyst bed, which process further comprises the steps of:

(a) setting the flow rate of the fuel and the flow rate of the oxygen-containing gas, preferably in accordance with the demand of conversion product and a pre-determined value of the oxygen/carbon ratio in the feed mixture;

(b) determining the actual temperature of the upstream surface of the catalyst bed by means of a quick response device within a time frame of from 1 to 100 milliseconds;

(c) generating an output signal that is a function of the difference between the actual temperature and a set point for the temperature; and

(d) using the output signal to adjust the flow rate of the fuel and/or of the oxygen-containing gas, preferably the flow rate of the fuel.

2. A process according to claim 1 operating under conditions of non-steady demand of conversion product.

3. A process according to claim 2, wherein the turn-down ratio in demand of conversion product is in the range of from 1:10 to 1:100, preferably of from 1:30 to 1:80.

4. A process according to any of claims 1 to 3, wherein the set point for the temperature is determined by the value of the oxygen/carbon ratio in the feed mixture and by the demand of conversion product.

5. A process according to any of the preceding claims, wherein the catalytic oxidation process is a catalytic

AMENDED SHEET

12-10-2001

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partial oxidation process and wherein the conversion product is a hydrogen-containing gas.

6. A process according to any of the preceding claims, wherein the quick response device comprises an optical pyrometer and wherein the determination of the actual temperature is carried out by measuring the light intensity emitted by the upstream surface of the catalyst bed.

7. A process according to claim 6, wherein the optical pyrometer is measuring the ratio between the light intensities emitted by the upstream surface of the catalyst bed at two different wavelength ranges.

8. A process according to claim 6 or 7, wherein the light intensity is measured at wavelengths in the range of from 700 to 1000 nm.

9. A process according to any of the preceding claims, wherein the adjustment of the flow rate in step (d) is carried out by means of a rapid response actuator.

10. A process according to claim 9, wherein the adjustment of the flow rate of the fuel is carried out by means of a pulsed liquid injection system.

11. Transport means comprising a system for the catalytic partial oxidation of a fuel that is operated according to any of the preceding claims.

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AMENDED SHEET

INTERNATIONAL SEARCH REPORT

Interr. Application No

PCT/EP 00/08441

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C01B3/38 B01J8/02 B01J12/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C01B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

API Data, WPI Data, PAJ, INSPEC, EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No
Y	EP 0 629 578 A (SHELL INT RESEARCH) 21 December 1994 (1994-12-21) page 4, line 14 - line 26 example 1 ---	1,4-11, 13,22
Y	US 4 789 540 A (JENKINS JOHN W) 6 December 1988 (1988-12-06) column 3, line 57 -column 4, line 12 ---	1,4-11, 13,22
X	US 5 939 025 A (AHMED SHABBIR ET AL) 17 August 1999 (1999-08-17) the whole document --- -/--	1,22

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- *&* document member of the same patent family

Date of the actual completion of the international search

4 January 2001

Date of mailing of the international search report

11/01/2001

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Authorized officer:

Van der Poel, W

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 00/08441

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of the relevant passages	Relevant to claim No
A	<p>RECUPERO V ET AL: "Hydrogen generator, via catalytic partial oxidation of methane for fuel cells"</p> <p>JOURNAL OF POWER SOURCES, CH, ELSEVIER SEQUOIA S.A. LAUSANNE, vol. 71, no. 1-2, page 208-214</p> <p>XP004112446</p> <p>ISSN: 0378-7753</p> <p>* 2. experimental *</p> <p>figure 1</p>	1
A	<p>PATENT ABSTRACTS OF JAPAN</p> <p>vol. 016, no. 455 (C-0987),</p> <p>22 September 1992 (1992-09-22)</p> <p>& JP 04 160003 A (KAWASAKI HEAVY IND LTD),</p> <p>3 June 1992 (1992-06-03)</p> <p>abstract</p>	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 00/08441

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0629578 A	21-12-1994	AT 195922 T	15-09-2000
		AU 672901 B	17-10-1996
		AU 6478694 A	22-12-1994
		BR 9402445 A	24-01-1995
		CA 2126036 A	19-12-1994
		CN 1101891 A,B	26-04-1995
		DE 69425692 D	05-10-2000
		JP 7010503 A	13-01-1995
		NO 942284 A	19-12-1994
		NZ 260621 A	26-03-1996
		RU 2123471 C	20-12-1998
		ZA 9404286 A	10-02-1995
US 4789540 A	06-12-1988	AT 47705 T	15-11-1989
		AU 580443 B	12-01-1989
		AU 6215686 A	05-03-1987
		CA 1290548 A	15-10-1991
		DE 3666689 D	07-12-1989
		EP 0217532 A	08-04-1987
		ES 2001647 A	01-06-1988
		JP 2079113 C	09-08-1996
		JP 7098641 B	25-10-1995
		JP 62059501 A	16-03-1987
US 5939025 A	17-08-1999	US 5942346 A	24-08-1999
JP 04160003 A	03-06-1992	JP 2631244 B	16-07-1997

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference TS 0793 PCT	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/EP 00/08441	International filing date (day/month/year) 29/08/2000	(Earliest) Priority Date (day/month/year) 31/08/1999
Applicant SHELL INTERNATIONALE RESEARCH MAATSCHAPPIJ B.V.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 4 sheets.



It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.



the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing:



contained in the international application in written form.



filed together with the international application in computer readable form.



furnished subsequently to this Authority in written form.



furnished subsequently to this Authority in computer readable form.



the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.



the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,



the text is approved as submitted by the applicant.



the text has been established by this Authority to read as follows:

CATALYTIC OXIDATION PROCESS WITH FLOW CONTROL SYSTEM

5. With regard to the **abstract**,



the text is approved as submitted by the applicant.



the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

1



as suggested by the applicant.



because the applicant failed to suggest a figure.



because this figure better characterizes the invention.



None of the figures.

Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

A process for the catalytic oxidation of a hydrocarbonaceous fuel (1) into a conversion product, wherein a feed mixture comprising the fuel and an oxygen-containing gas (2) is contacted with a catalyst bed (3), which process further comprises the steps of:

- (a) setting the flow rate of the fuel and flow rate of the oxygen-containing gas, preferably in accordance with the demand of conversion product and a pre-determined value of the oxygen/carbon ratio in the feed mixture;
- (b) determining the actual temperature (10) of the upstream surface of the catalyst bed by means of a quick response device;
- (c) generating an output signal (13) that is a function of the difference between the actual temperature and a set point for the temperature; and
- (d) using the output signal to adjust the flow rate of the fuel (6) and/or of the oxygen-containing (7) gas, preferably the flow rate of the fuel.

INTERNATIONAL SEARCH REPORT

International Application No

PCT 00/08441

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C01B3/38 B01J8/02 B01J12/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C01B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

API Data, WPI Data, PAJ, INSPEC, EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0 629 578 A (SHELL INT RESEARCH) 21 December 1994 (1994-12-21) page 4, line 14 - line 26 example 1 ---	1,4-11, 13,22
Y	US 4 789 540 A (JENKINS JOHN W) 6 December 1988 (1988-12-06) column 3, line 57 -column 4, line 12 ---	1,4-11, 13,22
X	US 5 939 025 A (AHMED SHABBIR ET AL) 17 August 1999 (1999-08-17) the whole document --- -/--	1,22

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

° Special categories of cited documents :

A document defining the general state of the art which is not considered to be of particular relevance

E earlier document but published on or after the international filing date

L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

O document referring to an oral disclosure, use, exhibition or other means

P document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

& document member of the same patent family

Date of the actual completion of the international search

4 January 2001

Date of mailing of the international search report

11/01/2001

Name and mailing address of the ISA

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Authorized officer

Van der Poel, W

INTERNATIONAL SEARCH REPORT

International Application No

PCT 00/08441

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	RECUPERO V ET AL: "Hydrogen generator, via catalytic partial oxidation of methane for fuel cells" JOURNAL OF POWER SOURCES, CH, ELSEVIER SEQUOIA S.A. LAUSANNE, vol. 71, no. 1-2, page 208-214 XP004112446 ISSN: 0378-7753 * 2. experimental * figure 1	1
A	PATENT ABSTRACTS OF JAPAN vol. 016, no. 455 (C-0987), 22 September 1992 (1992-09-22) & JP 04 160003 A (KAWASAKI HEAVY IND LTD), 3 June 1992 (1992-06-03) abstract	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PC 00/08441

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0629578 A	21-12-1994	AT 195922 T	15-09-2000
		AU 672901 B	17-10-1996
		AU 6478694 A	22-12-1994
		BR 9402445 A	24-01-1995
		CA 2126036 A	19-12-1994
		CN 1101891 A, B	26-04-1995
		DE 69425692 D	05-10-2000
		JP 7010503 A	13-01-1995
		NO 942284 A	19-12-1994
		NZ 260621 A	26-03-1996
		RU 2123471 C	20-12-1998
		ZA 9404286 A	10-02-1995
US 4789540 A	06-12-1988	AT 47705 T	15-11-1989
		AU 580443 B	12-01-1989
		AU 6215686 A	05-03-1987
		CA 1290548 A	15-10-1991
		DE 3666689 D	07-12-1989
		EP 0217532 A	08-04-1987
		ES 2001647 A	01-06-1988
		JP 2079113 C	09-08-1996
		JP 7098641 B	25-10-1995
		JP 62059501 A	16-03-1987
US 5939025 A	17-08-1999	US 5942346 A	24-08-1999
JP 04160003 A	03-06-1992	JP 2631244 B	16-07-1997